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PROCURING COMPLEX PERFORMANCE: THE TRANISTION PROCESS IN PUBLIC INFRASTRUCTURE

1. Introduction

Over the past two decades, organisations have increasingly bundled their products and services to add value to their core offerings (Vandemerwe and Rada, 1988; Spring and Araujo, 2009). Often this change is associated with a shift in focus from individual products or services to the provision of these as integrated solutions for organisations' business needs (Davies, 2004). Buying organisations are no longer interested in single products or systems with after-sales services. They want to buy "trouble-free" operational outcomes with guaranteed levels of performance over specified periods of time (Lewis and Roehrich, 2009). However, purchasing integrated solutions with complex performance outcomes confronts buying organisations with the challenge of developing and implementing new procurement strategies and associated organisational structures and capabilities (Caldwell and Howard, 2011; Zheng et al., 2008).

Although the shift towards integrated solutions attracts growing interest, the following three issues remain under-researched. First, a number of studies adopt a seller perspective and investigate different aspects of delivering product-service bundles (e.g. Mathieu, 2001). Limited research explores the buyer perspective and the procurement of integrated solutions (e.g. Lindberg and Nordin, 2008). It appears as if integrating services and products is first and foremost driven by selling organisations. However, if the value of integrated offerings emerges during their use (Vargo and Lusch, 2008), the procurement practices of buyer organisations play a key role in determining the benefit of integration (Flint and Mentzer, 2006). Second, previous research pays scant attention to the process of transitioning from the traditional procurement of products and services in isolation towards buying complex performance associated with integrated offerings (Johnstone et al., 2009; Pawar et al., 2009). This is surprising, as scholars claim that this transition constitutes a major challenge for organisations requiring the development of a new set of capabilities (Oliva and Kallenberg, 2003). Third, the public domain is neglected in the servitisation literature, although governments increasingly rely on the private sector and procure public goods and services in integrated packages (Koppenjan and Enserink, 2009), which are frequently underpinned by performance-based contracts (Caldwell and Howard, 2011).

We address the above limitations by answering the following research question: How do public buyers transition from procuring single products and services to procuring complex performance? We investigate our research question by conducting a longitudinal, multiple case study that follows two public organisations in the infrastructure sector. Both organisations made deliberate steps to introduce

complex performance procurement strategies based on integrated product-service packages. We contribute to the literatures on servitisation and complex performance procurement by identifying, describing and analysing three stages in the transition process towards the procurement of fully integrated product-service offerings: (1) the methods based, decoupled stage, (2) the asset-based, semi-integrated stage and (3) the services-based, integrated stage. We develop the argument that the transition of public buyers towards the procurement of complex performance is inherently bound to the establishment of value co-creation between buyer and supplier, which in turn demands the development of new contractual and relational capabilities of both the buying and the supplying organisation.

The paper has six sections. Section 2 discusses the three main concepts supporting our research: procurement of complex performance, value co-creation and contractual and relational capability development. Section 3 offers considerations of methods for our research. A detailed description of how the two public organisations move towards procuring complex performance is presented in Section 4. Section 5 discusses our findings based on our initial argument. Section 6 concludes by providing directions for future research and formulating theoretical and managerial implications.

2. Conceptual Background

2.1 Procuring complex performance

Although a growing body of literature explores areas such as public procurement (Schiele and McCue, 2006), product-services systems and delivery (Spring and Araujo, 2009; Corrêa et al., 2007) and complex outsourcing arrangements (Holcomb and Hitt, 2007), there is less research on the transition from traditional asset acquisition to procuring complex performance (PCP) (Caldwell and Howard, 2011). Lewis and Roehrich (2009) define PCP as inter-organisational arrangements involving significant levels of performance complexity and infrastructural complexity. Performance complexity refers to the number and inter-relatedness of knowledge intensive activities that are needed to ensure a specific performance outcome of an infrastructure system. Infrastructural complexity refers to the number and inter-relatedness of assets of an infrastructure system and can be characterised by the extent to which it is 'bespoke or highly customised' (Brady et al., 2005). PCP shifts the conceptual orientation away from a paradigm of, for instance, scale in manufacturing towards customer demand for bespoke product-service solutions (Howard and Caldwell, 2011). The servitisation literature offers various terms to refer to the provision of bundles of products and services. Although some authors refer to product-service systems to capture the activities linking products and services (Baines et al., 2008), we use the term integrated solutions because there is now a growing body of research in innovation and organisational studies which shows how products and services are designed and integrated to provide performance-based solutions that address specific customer needs (e.g. Davies et al., 2007; Ceci and Massini, 2011). The use of the notion 'solution' draws attention to the need for buyers to participate with suppliers in the co-creation process by

jointly developing customer-centric organisational designs and highly effective procurement capabilities (Galbraith, 2002; Kapletia and Probert, 2010).

The complexity of procuring integrated solutions is reflected in the governance of long-term supply relationships (Howard and Caldwell, 2011). In this sense PCP extends the transaction-based logic. Considering the issue of complexity through the lens of transaction-cost economics based on assumptions of opportunism and bounded rationality (Williamson, 1985), organisations aim to minimise the costs of transacting. Hence, organisations seek to internalise activities where adverse costs arise from operational difficulties in a market exchange, primarily because of uncertainty, frequency and asset-specificity (Williamson, 1985). However, the transaction-cost perspective is unable to fully explain the management and procurement of complex performance. As Holcomb and Hitt (2007) clarify: "the complementarity of capabilities, strategic relatedness, relational capability-building mechanisms, and cooperative experience [are equally] important conditions" (p.465). In the following sections, we argue that the complementary theoretical lenses of value co-creation and capability development in a dyadic setting are essential to understand the transition towards PCP.

2.2 Co-creating value

Prior research conceptualises value in a variety of ways (Anderson and Narus, 1998; Dyer and Singh, 1998). For example, Porter's (1985) concept of a value chain has proven useful for describing the physical activities performed by manufacturing firms. Economic implications of different activities are studied at the firm and intra-organisational level, considering value creation as sequential and 'added' in each part of the chain (Ramirez, 1999). However, as products and services become dematerialised and the value chain becomes less reliant on physical processes, research focuses on new ways of understanding sources of value creation (Stabell and Fjeldstad, 1998), particularly co-operative behaviour and inter-firm relationships (Håkansson and Snehota, 1995; Kickul et al., 2011).

Value creation addresses multiple levels of analysis ranging from individuals to industries (Lepak et al., 2007) and from 'internal value' to 'relational value' (Henneberg et al., 2009). Value is often co-created within buyer-supplier relationships (e.g. Ramsay, 2005; Cheung et al., 2010), dyadic organisational relationships (Walter et al., 2001) or through networks of organisations (Lindgreen and Wynstra, 2005). From this perspective, value is embedded in the interactions between organisations and emerges through the joint working of the organisations' resources (Vargo and Lusch, 2004). Value co-creation is characterised as a process by which the resources of at least two organisations are combined in order to achieve something that the parties could not achieve individually (Borys and Jemison, 1989). Ramirez (1999) argues that an industrial view of value creation sees customers as consumers destroying the value created by producers. However, customers should be considered as co-creating value collaboration with their suppliers. For instance, Prahalad and Ramaswamy (2004) argue that an organisation's relationship with a customer offers access channels to the customer's ongoing value-creating activities.

Organisational resources and capabilities are vital drivers for value creation. For example, Stabell and Fjeldstad (1998) draw out the importance of contractual capabilities and network promotion to create value. Hence, to understand value creation in PCP arrangements, we address the inter-organisational level of analysis (Brax and Jonsson, 2009). We expand on the existing literature on value creation by empirically investigating the dyadic interactions between parties moving towards PCP arrangements. In addition, the long-term nature and inherent complexities of PCP arrangements further augment the importance of relational and contractual capability development to govern and guide the development of long-term relationships and value co-creation.

2.3 Capability development

Capabilities can be dynamic and operational. Operational capabilities refer to the skills and knowledge residing in an organisation to perform productive activities and daily operational routines (Helfat and Peteraf, 2003). Dynamic capabilities refer to the strategic ability of the firm to integrate, build and reconfigure skills and knowledge to address a changing environment (Teece et al., 1997). Capabilities are the result of the co-evolution of tacit knowledge accumulated through learning-by-doing and embedded in an organisation's routines, and explicit knowledge articulated and codified through deliberate cognitive efforts and investments to improve an organisation's routines and activities (Zollo and Winter, 2002). The heterogeneity of capabilities across organisations is then a reflection of investments of time, efforts and resources in learning activities (Ethiraj et al., 2005). Capability development is specifically supported by experiences gained during the move from novel to routine project activities (Brady and Davies, 2004). Developing capabilities to manage PCP arrangements over extended time periods is vital for organisations across various sectors, and there will inevitably be multiple distinct governance challenges associated with this process (Lewis and Roehrich, 2009). For example, PCP markets are often characterised by (near) monopolistic market structures, highly politicised decision models, government regulators and long lead times in commissioning, designing, building and operating. Life cycles extending over decades introduce further uncertainty and complexity, requiring capabilities to procure and manage complex performance.

We distinguish between two inter-related types of capabilities needed to manage and procure complex performance: contractual and relational capabilities. Contractual capability refers to the recognition of the contingencies associated with complex performance and their implications for the efficiency and effectiveness of the service delivery (Hartmann et al., 2010). They are vital in order to write, negotiate, monitor and enforce contracts (Mayer and Argyres, 2004). In addition, "learning as enshrined in contracts is an important manifestation of the general phenomenon of learning to manage inter-firm relationships effectively" (Vanneste and Puranam, 2010, p.186). Organisations can structure complex contracts and protect relationships against opportunism by relying upon legal rules, standards and remedies implied in the law (Achrol and Gundlach, 1999). However, in practice it is

rarely possible or desirable to draft complete contracts owing to the complex nature of the task, asymmetric information and associated costs (Poppo and Zenger, 2002). In such situations, organisations deploy incomplete contracts with an element of uncertainty that makes them unenforceable in their entirety. Due to their inherent flexibility, these contracts are often better suited to deal with changes caused by environmental or endogenous contingencies. It is therefore up to the parties involved to decide how much of the contract content and process specification should be pre-determined up-front or negotiated during the contractual period.

Relational capabilities are important to build inter-personal and inter-organisational trust and foster learning across organisational boundaries. They refer to the application of socially complex routines, procedures and policies in inter-organisational relationships (Johnson et al., 2004). Organisations invest in relationship-specific assets, substantially exchange knowledge with each other, combine complementary but scarce resources and effectively govern their relationship (Dyer and Singh, 1998). Contractual governance mechanisms (e.g. control and monitoring systems) are complemented by relational coordination mechanisms (i.e. trust and cognitive alignment) to prevent conflicts and adversarial behaviour and to promote problem-solving and information exchange (Carey et al., 2011). Although previous studies have investigated the importance and interplay of contractual and relational governance (Poppo and Zenger, 2002; Mahapatra et al., 2010), limited research has explored the development of contractual and relational capabilities as a consequence of value co-creation in the context of PCP. It is this inter-relatedness of the three research streams that is the focus of our research and reflected in our research question: How do public buyers transition from procuring single products and services to procuring complex performance?

3. Methods

3.1 Research setting

We conducted a longitudinal, multiple case study of two public authorities that are transitioning towards PCP: the Highways Agency (HA) in the UK and Rijkswaterstaat (RWS) in the Netherlands (Table 1). We selected these cases for two reasons. First, as executive arms of the Ministry of Transport in their respective countries, both organisations are responsible for operating, maintaining and improving the national strategic road and water network. During the last decade, both agencies have decreased in size while expanding their network operator role and have placed stronger emphasis on the needs of customers and users. Both have outsourced core activities and become increasingly reliant on external suppliers to deliver services. As a result, both agencies depend on effective procurement capabilities. Second, the two cases provided opportunities to reveal similarities and differences through cross-site comparison (Yin, 2004). This provides scope for theory extension and potential development (Strauss and Corbin, 1990)

<Insert 'Table 1: Key characteristics of both public infrastructure organizations' about here>

3.2 Data collection

Our unit of analysis is the organisational transition process towards PCP of a particular type of tasks: infrastructure maintenance. That encompasses contractual changes, value co-creation and capability development. Between 2007 and 2009, we conducted 34 semi-structured interviews with people involved in different stages of the transition process in both public organisations. Recognising the importance of exploring the wider network of suppliers, interviews were conducted with a number of private partners to address retrospective and current activities. Respondents were drawn from multiple functions, such as contract managers from corporate procurement, area managers from regional business units, senior managers concerned with strategy and project managers. We asked questions about the rationale for moving to a new procurement practice, changes in organisational strategy and structure, the skills and knowledge needed to execute the procurement strategies and find novel ways of working with external partners and associated contractual changes. Interviews, conducted by two or more of the researchers, lasted between 60 and 160 minutes and were tape-recorded and transcribed. Data collection stopped when we experienced conceptual saturation. After each interview, we had short discussions regarding the respondent's interpretation of key events and main mechanisms at work, and we prepared brief memos. These were used for data analysis in NVivo.

We triangulated data to overcome common method bias and improve internal and external validity and case study rigour (Gibbert et al., 2008). Because of the public ownership of the organisations we studied, rich documentation was freely available. In addition, both organisations willingly shared internal memos from board and strategy meetings such as presentations, project reports, minutes from meetings and briefing notes to provide a rich description of the investigated cases.

3.3 Data analysis

We used abduction reasoning – or what Dubois and Gadde (2002) call 'systematic combining' – to guide our analysis of the data. The approach draws on existing theory and seeks to generate justified research questions, analysis and conclusion as to what the causal drivers for specific events were, rather than to employ a purely inductive or deductive logic.

All authors read our dataset; including interview transcripts, documents and additional field notes. We systematically coded our data into major thematic categories and concepts (Strauss and Corbin, 1990). Most categories corresponded with our pre-established theory frame while others can be characterised as emerging topics based on our empirical data. Data from both cases were subsequently summarised and written up as reports. These formed the basis for follow-up discussions with interviewees. Codes emerged from the conceptual background and analysis stages including interviewee background, organisation's responsibilities and more specific codes such as inter-organisational development

processes, new skills, inter-personal networks, content and transitions of contracts, and key challenges of managing new partnerships and contractual structure. Data were coded, summarised and displayed in an iterative fashion (Miles and Huberman, 1994), informing the structure of the findings and discussion sections. Our procedure of iteration – travelling back and forth between data analysis, data collection and pertinent literature – enabled us to engage in theory building. Additionally, in 2007/2008 we conducted three focus group meetings during which preliminary results were presented and discussed with senior managers. This was an important credibility check to aid the interpretation of our findings.

4. Findings

In the period of our study (2000-2009), RWS and HA occupied different stages in the PCP transition process. The RWS was relatively inexperienced compared with the HA and traditionally procured prescribed maintenance work for single assets. The increase in procurement complexity began in the late 1990s when the RWS started to integrate maintenance activities for multiple road assets and formulated performance specifications for maintenance work. The HA, by contrast, has been procuring integrated maintenance services based on performance specifications since its inception in 1994. Here, additional procurement complexity was associated with the integration of maintenance services and improvement schemes making the supplier fully responsible for the provision of high-performing infrastructure assets and networks.

Despite these differences in PCP maturity, both cases share similar process characteristics, including the way services and assets were integrated, the duration of contracts, the extent of value co-creation and the capabilities developed. The transition process was driven by external policy pressures and new public procurement objectives laid out in governments reports in the UK (e.g. Egan, 1998) and the Netherlands (e.g. Ministerie van Verkeer en Waterschap, 2002). Both organisations were compelled to revise their strategies to meet government objectives, improve procurement processes and forge stronger relationships with private-sector suppliers.

The similarities and differences of the two cases allowed us to identify a transition process towards PCP consisting of three stages (Table 2): method-based/decoupled, asset-based/semi-integrated and service-based/integrated. The RWS moved from the method-based/decoupled stage to the asset-based/semi-integrated stage, while the HA moved from the asset-based/semi-integrated stage to the service-based/integrated stage. In the next sections we elaborate more on the three transition stages.

<Insert 'Table 2: Transition stages towards PCP' about here>

4.1 Stage 1: the method-based, decoupled stage of procurement

Performance and infrastructure complexity

Until 2000, the RWS purchased maintenance work from suppliers by stipulating work requirements. The performance complexity at this stage is considered low because the ex-ante detailed prescription of product and service to be delivered included the required performance level and left little scope for the supplier to determine or shape upfront performance targets. The infrastructural complexity is also considered low because single services for single infrastructure assets were procured. Each road district in the 10 regional areas of the RWS had several contracts for routine maintenance (e.g. drainage cleaning) and renewal schemes (e.g. pavement renewal) for assets (e.g. bridge). Services were delivered by different suppliers and coordinated by the RWS. Contracts were let either for discrete projects (renewal schemes) or on a yearly basis (routine maintenance).

Value co-creation

In stage 1 of the transition process, value creation was an outcome of a clear contractual and organisational separation of tasks and responsibilities with interaction between the RWS and the supplier restricted to information sharing about the requested work. The decoupling of services and assets combined with detailed work specifications fostered the development of clearly marked domains of specialised knowledge. The domain occupied by the RWS included knowledge associated with the technical performance of infrastructure assets, organisational and legal conditions as well as the coordination and integration of services from multiple suppliers. The supplier's domain referred to its production skills, including the implementation of maintenance technology.

Capability development

The contractual challenge during this stage was how to specify maintenance work so that RWS employees could control the fulfilment of the contractual requirements by the contractor. The RWS used its contractual capability to develop precise specifications of input parameters for the supplier's work process and demarcate the service and asset. This ensured that maintenance was provided as expected. It avoided any misinterpretations and disputes that might arise regarding the quality and extent of the work. A successful outcome could only be achieved if domains of knowledge remained independent to minimise the possibility of information asymmetry between buyer and supplier associated with a hostile environment of mistrust and control. However, there were situations not addressed in the contract and that provided room for ambiguity. In such cases, RWS and its suppliers had to revert to relational capabilities to resolve conflicts stemming from this interpretive ambiguity.

4.2 Stage 2: the asset-based, semi-integrated stage of procurement

Performance and infrastructure complexity

During stage 2 of the transition process, performance and infrastructure complexity increased because services were combined and were procured to deliver specified performance for one or more infrastructure assets. Both agencies transferred responsibilities and risks to a main supplier for the duration of 3-5 years and relied on the supplier's knowledge to deliver the required asset performance.

In 2000, the RWS decided to move from procurement based on a detailed prescription of maintenance work to specifying asset performance and requiring a single-point responsibility for routine maintenance of multiple assets. The intention was to make use of the suppliers' knowledge of maintenance technology and give suppliers the freedom and incentive to optimize their work processes. In 2007, the RWS continued to integrate maintenance work across different assets (e.g. pavement and road furniture) and developed new contractual elements to improve maintenance efficiency. As a result of this, the supplier took on additional activities, such as the inspections of the perennial planning of routine maintenance and electronic data storing of maintenance activities. Suppliers now assumed responsibility as service provider for entire assets which also included improvement schemes up to €1m.

In contrast with the RWS, the HA has always been heavily reliant on external suppliers. Since its inception in 1994, the HA had contracted out planning and execution of maintenance work and integrated all routine maintenance services and small improvements in performance-based contracts. Initially, the HA worked with two types of supplier organisations: the Managing Agent (MA) and the Term Maintenance Supplier (TMC). The MA worked directly for the HA and was responsible for planning and designing maintenance work for all road infrastructure as well as the supervision of the TMC. The TMC performed all maintenance work such as routine, cyclical and winter maintenance and small improvement works up to £100,000. As a result of this contractual division of tasks, a "throw it over the wall" way of working was created between MA and TMC, each with their own specialised domain of knowledge. *"We know it needs to be done, because they [MA] have inspected everything out there on site and told us[HA] that we need to do so-and-so. So we will say, 'well then, go and prepare a scheme'. They [MA] sit in their ivory tower, experienced consultants, we know how to design a scheme, and then issue that to these people [TMC] to build it. This is very much doing what they are told"* (HA area manager). In 2001, the HA combined MA and TMC to form a prime contractor role, the Managing Agent Contractor (MAC). Under this structure, one supplier was responsible for delivering front-line maintenance services for all road assets in a particular area including improvement schemes up to £500,000.

Value co-creation

The supplier was now responsible for the co-ordination and provision of integrated maintenance services. The agencies and their suppliers had to work together to define and meet performance targets (e.g. availability) for each asset. In a highly interactive process of co-creation, both organisations had to find a way of making effective use of each other's domain of knowledge.

At the RWS, for example, suppliers were given the possibility to suggest innovative improvements. When the suppliers first took on their new role, they did not have a comprehensive understanding of technical structure and performance behaviour of the road assets. Consequently, they were unable to

generate novel ideas capable of meeting the RWS's targets for asset sustainability, availability and reliability. Over time, the RWS and its suppliers recognised that improvements in asset quality depended on their ability to share knowledge: "*We made a list of improvement suggestions…On the one hand we made some suggestions and on the other hand the supplier made some suggestions. This was a good mix in terms of common thinking and joint development of an improvement plan*" (RWS contract manager).

The HA faced the challenge of combining the knowledge and experience held by the MA and the TCM. A partnering approach had to be forged to overcome the previous difficulties associated with the contractual and organisational division of tasks. The process of value co-creation was dependent dependant on the adoption of an organisational innovation: the integrated project team composed of the HA and the MAC supplier which was responsible for guaranteeing the required asset quality and solving performance and maintenance problems. *"I think one of the many things the MAC has done is to provide this integrated team. […] We will have regular meetings where you will have our supply chain partners, HA and us there; all discussing a common way around the problem. You are getting all the different perspectives from the stakeholders. The suppliers coming in and saying, actually if you programmed it this way it would take you three days less because you would be able to do this as opposed to that. I think there is an awful lot of learning taking place […]"* (Supplier's business manager).

Capability development

The RWS faced a number of contractual challenges, including how to manage large integrated maintenance contracts under the control of a single supplier in a market with few opportunities for small and medium suppliers. But the most difficult challenge was to specify a detailed and workable description of the required performance. At the beginning, functional descriptions of maintenance work such as "a clean road" were highly ambiguous and open to interpretation. Not surprisingly, the suppliers tended to comply with these requirements by deploying minimal resources. *"You always have discussions and there are always interpretation differences. The supplier wants to make profit and we want to have the object functional and reliable for as long as possible"* (RWS asset coordinator). Under this arrangement, RWS employees were no longer required to measure the amount of work performed by the supplier. The supplier was now responsible for monitoring and reporting activities. But the RWS made infrequent checks to ascertain whether its suppliers actually complied with the performance requirements. However, RWS employees began to disengage from maintenance activities. Expectations about the extent and quality of maintenance work differed markedly between the RWS and its suppliers. This discrepancy became apparent when unexpected situations arose that could not be easily dealt with by the contract. Suppliers felt that the RWS needed to clarify how to deal with emergent problems not specified in the contract. The RWS expected the supplier to manage all maintenance aspects as part of their project quality plan. Consequently,

employees in both organisations had to learn how to manage contracts and cooperate with each other. They could no longer rely on traditional habits, behaviours and ways of working. They had to learn how to communicate and negotiate with each other. For RWS employees the focus began to shift from saying "what to do" to understanding "how work is done": *"[...] and what I have recognised is that people find it very difficult to disengage and that the supplier has to do it by himself. The supplier has to solve problems alone and you have to look at how the supplier has set up these processes. It is very difficult for people to get rid of the old ways of thinking [...]"* (RWS regional manager).

The challenge facing the HA was to develop a contractual way of specifying and coordinating the design and execution of the MA and TMC services. However, this was not properly addressed. It resulted in a highly inefficient approach with two organisations supervising the TMC. The HA tried to overcome this co-ordination problem by creating a single MAC supplier and developing its own relational capabilities. Subsequently, the HA and the MAC had to ensure that they had people in place with the competencies and experience to engage in a partnership. Members of both organisations felt that they needed some preparatory time to work under the new contractual situation, to forge effective integrated project teams, align each other's expectations and get to know each other's qualities and share knowledge. They had to learn on their own to apply the contracts with little assistance from the procurement department. As in the RWS case, our interviews revealed that employees had to work together to solve problems cooperatively. They had to resist the temptation to revert back into MA/TMC behavioural patterns, such as traditional "supplier" and "consultant" roles. "*I think it is fair to say that it has moved away from a sort of master-servant relationship. […] They used to be saying sort of, go and do that and come back when you are done. Whereas now it is more of a partnership and we are part of the team. It takes different people a longer time to adjust to those different rules.*" (Supplier's project manager). Some members of the teams had to develop skills to communicate with, encourage and support employees involved in new cooperative working relationships.

4.3 Stage 3: the service-based, integrated stage of procurement

Performance and infrastructure complexity

In 2005, the HA increased the limit for improvement schemes to £2m. A prime contractor was subsequently responsible for all maintenance services and improvement schemes for a specific road network. In addition, the HA introduced cost-reimbursement contracts with yearly target costs for the desired service levels, which required recurrent negotiations between the HA and the supplier. With this reimbursement approach, the HA experienced greater uncertainty about the amount of future costs incurred. But yearly cost renegotiation helped define the expected service level changes over a contract period of 5 years plus 3 years of possible extension. The HA mitigated the uncertainty associated with long-term service contracts by requiring yearly changes in costs to address emergent situations "*[…] you have got rolling target prices where you are not trying to define a level of service at year one or year minus one of a five-year contract […]. We are in such a volatile age these days in*

terms of service provision, not really knowing what we want next year, let alone in five years' time, it is very valuable to be able to change the service every year and to get a new price for it" (HA area manager).

Value co-creation

During stage 3 in the transition process, suppliers had to develop new knowledge to understand how network performance improved service provision. In the HA case, the supplier had to work more closely with the agency to provide services focused on the road users, including meeting targets for road safety and reliability. *"By having no threshold for maintenance work and the fact that they are paid on the same basis, no matter what the work is, the theory is that it should encourage them to look at maintenance from the objective of the HA, which obviously cost is still an important part, but also adopting a customer focus"* (HA project manager). The co-creation efforts intensified, because the supplier's role was to assist the HA, rather than to carry out work on its behalf. To achieve service outcomes for an entire road network (the HA's new strategic objective), attention focused on the quality of the network services. The supplier played an active "self-certifying" role in setting target costs and preparing detailed forward programs. The HA introduced an open-book policy to gain access to the supplier's detailed costs and forecasts for routes, activities, budgets and resources. The main benefit was a more flexible means of undertaking work without needing to plan several years in advance. According to our interviewees, the integrated project team approach offered a flexible and rapid response to unforeseen changes in demand for maintenance services and, by doing so, enabled them to meet the HA's objective of an assessment of best value.

Capability development

From a contractual perspective, it became essential for the HA to specify service quality and incentives so that the supplier was able to comply with its requirements. The supplier received payment on a target/actual cost basis with a 'pain/gain' share of profits depending on its performance based on an up-front bonus payment of 2.5% of profits, plus a 5% bonus if work was completed on time and to specification. The adoption of cost-reimbursement with target costs meant that the relational challenge now lay in building trust with open-book accounting. Close personal ties had to be forged between members of the HA and supplier teams to create a partnership based on mutual expectations about the service delivery. The HA and supplier teams were set up to mirror each other's organisation, based on maintaining, operating and improving work streams. The HA became involved in the supplier's human resource activities to ensure that the suppliers' staff were kept informed about the new technologies, techniques and skills required to run the contracts. Close proximity of HA and suppliers enabled managers from both organisations to share each other's offices. *"We are lucky because their office is only 20 minutes from here and you will find that a lot of my team will spend half the week there and going to meetings. There is a lot of regular formal dialogue in terms of meetings, but there is an awful lot of regular informal dialogue too"* (HA area manager).

5. Discussion

We used our case study findings to identify three stages in a transition towards the procurement of complex performance, focusing on the case of public infrastructure provision. We now discuss the contextual and cyclical nature of this transition process (Figure 1) and identify our contribution to the literature.

5.1 PCP transition and the role of the buyer

Our case studies indicate that the transition towards PCP is not restricted to business-to-business relationships, but also emerges in the wider realm of business-to-government and public-private partnerships. In the public domain, PCP is a response to an increased inability of the state to finance the delivery of public services and a promise for more value for money (Grimshaw et al., 2002). Politically-imposed resource reductions (e.g. maintenance budget, employees) and end-user orientation has forced agencies to change their procurement practice and introduce long-term, integrated performance-based contracts for infrastructure maintenance (Figure 1). In other words, buyers in our cases predominantly initiated and formed the PCP transition and, hence, set the directions and benefits of the suppliers' offerings. The PCP transition to integrated solutions provision was demand led (Kapletia and Probert, 2010). This stands in sharp contrast to research in other sectors which emphasises the supplier's role in defining integrated solutions (e.g. Hobday et al., 2005). While recognising that suppliers contribute to the transition process our findings clearly underline the buyer's role in shaping this process. It is surprising that most of the servitisation literature neglects this role and overemphasises the supply side. The concept of value co-creation loses cogency if one side of the coin is widely ignored (Payne et al., 2008). Based on our case findings, we propose that the transition towards PCP involves a strong interplay of buyer and supplier in the creation of value. This echoes a recent argument that: "the legacy of linear, one-directional and clearly boundaried thinking from the manufacturing-based environment needs to be replaced with the interactive, fluidly boundaried, multi-dimensional thinking of a complex service system that includes people from the customer organisation and the firm, equipment, processes and physical environments" (Ng et al., 2010, p. 36).

<Insert 'Figure 1: PCP transition process' about here>

5.2 PCP transition and value co-creation

Our case study findings revealed that the transition to PCP involves a process of establishing value co-creation between buyer and supplier. This process is closely related to what Henneberg et al. (2009) call a relational value strategy characterised by collaborative interactions between dyadic exchange partners. The interaction between buyer and supplier intensifies at each transition stage because with the increase of performance and infrastructural complexity the service delivery of both organisations becomes more interdependent (Van der Valk and Wynstra, 2010). In our cases, the

agencies increased their focus on operating the road network and providing services to users (e.g. traffic management). As long as the agencies coordinated and decided on parts of the maintenance activities, they retained control on the alignment of maintenance work and network availability. When the suppliers became responsible for guaranteeing the availability of the network and avoiding service down time, agencies and suppliers had to align their activities, share knowledge and adapt their services. The cases suggest that with the procurement of complex performance, value is not simply co-created when the buyer makes use of the supplier's offering (Vargo and Lusch, 2008). Value co-creation starts at an earlier stage of the relationship when buyer and supplier interact and align their expectations about the service delivery. This process of adapting and aligning continues throughout the relationship to improve service provision and resolve emergent and unexpected problems. Dealing with unexpected situations requires the joint creation of "new 'added' value in terms of the available solutions" (Möller, 2006, p. 917).

Our empirical data indicates that value co-creation was not strategically motivated "to mobilize the creation of value in new forms and by new players" (Normann and Ramirez, 1993, p.66). In both cases, value co-creation was not the product of a strategic decision to achieve the reconfiguration of roles and relationships among actors. It rather emerged from a politically-driven process involving the integration of maintenance services and infrastructure assets and the transfer of tasks and responsibilities to the private sector (Figure 1). In the RWS, that transfer of tasks and responsibilities to the supplier was initially undertaken to reduce the agency's involvement in the value creation process. In the HA case, value co-creation was not a strategic priority. It only became evident when the newly formed integrated project teams did not receive the support and resources required to apply new maintenance contracts. Our findings show that value co-creation and the interaction between agency and supplier were unintended consequences of the changed procurement practice (Schofield, 2004).

5.2 PCP transition as a learning process

Our findings suggest that redefinition of capabilities in order to procure complex performance is a consequence of value co-creation (Möller, 2006; Ng et al., 2011). Transitioning through the three stages depended on a continuous process of learning and interaction between buyer and supplier (Figure 1). Specific contractual and relational capabilities become important during each stage (Poppo and Zenger, 2002), but also inter-related over time.

As the RWS case shows, a number of contractual challenges were to be mastered while moving to the asset-based/semi-integrated stage, including performance description, extent of service integration, task design and contract control. The relational challenges then emerged from the effects of contract specifications and were associated with differences in interpretations and expectations about the service delivery. In order to co-create value, the RWS and its suppliers needed to pool their collective

knowledge, develop a common understanding of their role and responsibilities in the value creation process and engage in joint problem-solving. The HA case, on the other hand, indicates that when moving to the service-based/integrated stage, the contractual challenges focused on configuring appropriate incentives based on the reimbursement scheme and contract duration. Again the need for relational capabilities stemmed from the effects of contract specifications which here pertained to the commitment of two organisations with inter-related services and asked for the development of trust-based relationships embodied in integrated project teams. Both cases reveal that relational capabilities evolve through and are embedded in contractual interactions between the buyer and supplier. Organisations learn to work under changing contractual conditions at each transition stage. This enables them to combine and advance their contractual and relational knowledge across the stages. In line with previous studies, we argue that the capability development to procure PCP follows a path of emergence, development and maturity over time (Helfat and Peteraf, 2003).

6. Conclusions

Our research identifies a shift towards new ways of procuring complex performance in public infrastructure. While not intending to generalise into other contexts without further validation, our findings identify three distinct stages in the transition toward PCP. As case examples show, public infrastructure provision is being redesigned to introduce a greater reliance on the private sector. Such changes in procurement depend on new forms of contracts and relational capabilities, including incentive systems and mutually-supportive interactions between buyers and suppliers.

PCP is an emerging phenomenon which the prior literature on servitisation largely ignores. This paper focused on the transition from procuring single standalone services and products to fully integrated solutions for complex performance targets. Our research demonstrates that the transition process initiates and is in itself an interactive value co-creation process between buyer and supplier. New contractual and relational capabilities are required to support value co-creation at each stage of the transition process. Our cases reveal that the politically-driven procurement practice of the public buyer is a main driver behind the transition process, influencing the extent to which value co-creation can be established. Our finding contrasts with much of the servitisation literature, which ascribes the main role in integration of products and services to the supplier. Despite the dominant position of the buyer in our cases, value co-creation only emerges through the interaction of buyer and supplier. We suggest that future servitisation research should pay more attention to the inter-organisational relationship, which would clearly acknowledge the interdependent contributions of the buyer and supplier in the delivery of integrated solutions.

Our research has four main implications for the management of public infrastructure. First, the three-stage model helps managers in public agencies to identify the procurement approach and the

contractual and relational challenges they need to master when facing higher levels of performance and infrastructural complexity. Second, public managers need to consider value co-creation as a rationale for capability development. The assumption that the transfer of responsibility for integrated solutions from the public buyer to the private supplier disengages the buyer from the service delivery ignores the ongoing interaction between buyer and supplier in the value creation and capability development process. Third, public managers should pay more attention to learning from previous buyer-supplier interactions. They are often urged by political agendas to rapidly implement new procurement schemes, while neglecting to understand the learning and time needed to put new principles into practice. Here, corporate organisational units may help provide project teams with a protective cushion to explore how to implement new contract documents and experiment with novel buyer-supplier relationships. These units could capture and transfer the experience gained by the teams, which could then be embodied in adjusted contract elements and routines. Fourth, although our research did not focus on the appropriateness of PCP transition, it indicates a possible limitation of the procurement of performance-based service packages. At the asset-based/semi-integrated stage the supplier bore the risk if the applied technology or solution did not achieve the required performance. Risks – such as traffic disturbances as a consequence of the additional work to restore the asset – lay with the agency. Although engaging in a close dialogue and exchange of knowledge would help to understand which organisation is responsible for the risks associated with road infrastructure, such an arrangement may not provide clear guidance for the allocation of risks and responsibilities to, for example, high-risk water infrastructure (e.g. flood protection). Suppliers are not considered able to bear the risks if these assets malfunction and the agencies are not able to directly manage them. Instead of generally procuring complex performance for all types of infrastructure, agencies should carefully review their procurement policies and evaluate the appropriateness of integrating services and shifting responsibilities to the private sector.

Our research built on prior literature to study how complex performance is procured. Our case studies provide an opportunity to theorise about how value co-creation and capability development are inter-twined in PCP. Our findings would benefit from further research into other industries and across different countries because our study was restricted to public infrastructure and public-private relationships. Research should investigate the extent to which the three transition stages are applicable to other organisations and identify the challenges they face when moving towards PCP. Future research could explore the challenges for the suppliers of integrated product-service packages stemming from the interaction with the buyer and the dominant role of public buyers in this process.

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Tables

Table 1 Key characteristics of both public infrastructure organizations

	RWS	**HA**
Number of employees (2009)	9,288	3,800
Infrastructure	5,695 kilometres of main roads 1,259 kilometres of entry and exit slip roads and link roads 1,686 kilometres of canals and rivers 6,165 kilometres of open waterways 65,250 km^2 of national water system	10,500 kilometres of single or dual carriageway roads and two, three or four lane motorways
Organisational structure	10 regional areas including 20 road districts and 16 water districts five corporate centres and three project directorates	14 regional areas seven regional control centres and a national control centre one corporate centre

Table 2 Transition stages towards PCP

	RWS	**RWS / HA**	**HA**
Key characteristics	**Stage 1: Method-based / Decoupled**	**Stage 2: Asset-based / Semi-integrated**	**Stage 3: Service-based / Integrated**
Scope of performance	Process capacity	Asset efficiency	Asset effectiveness
Scope of infrastructure	Single services for single assets	Multiple services for multiple assets	Multiple network services
Contract duration	<1 year	3-5 years	>5 years
Value co-creation	None	Knowledge exchange	Knowledge creation
Co-created value	None	Asset quality	Service quality
Contractual capability	Specification of maintenance work Delimitation of service and asset	Specification of asset performance Clustering of service and asset	Specification of network performance Definition of incentives
Relational capability	Interpretation and expectation acceptance Conflict resolution	Interpretation and expectation alignment Problem solving	Interpretation and expectation forming Trust building
Performance complexity	Low	Medium	High
Infrastructural complexity	Low	Medium	High

Figures

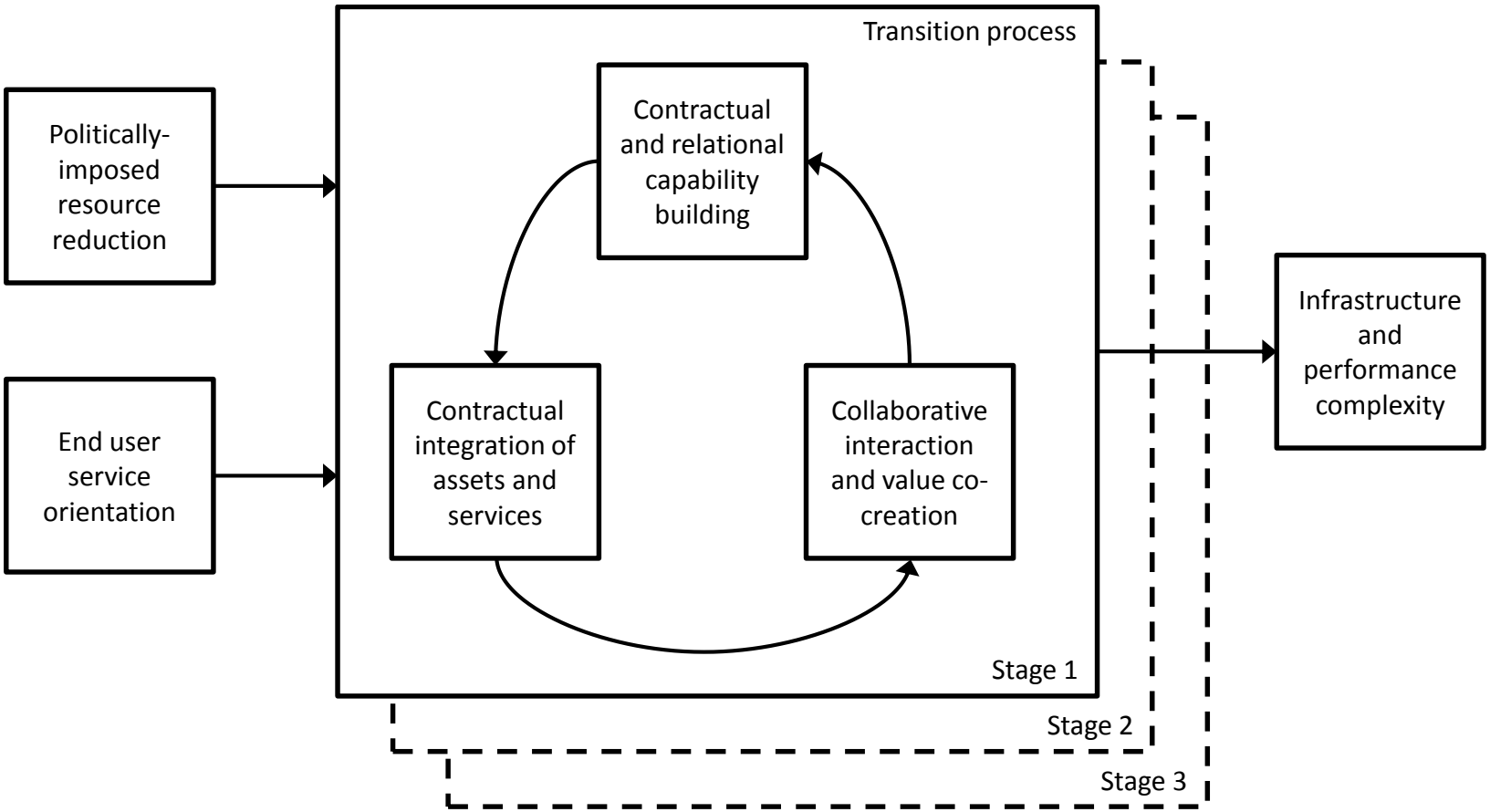

Figure 1 PCP transition process